

Quality Reviews of FUDS MMRP GIS Data

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Presentation Outline

- **FUDS-MMRP Geospatial Data and Standards**
- **Project Data Reviews – Historical Photos & Metadata**
- **GIS Metadata Tools**
- **Summary**



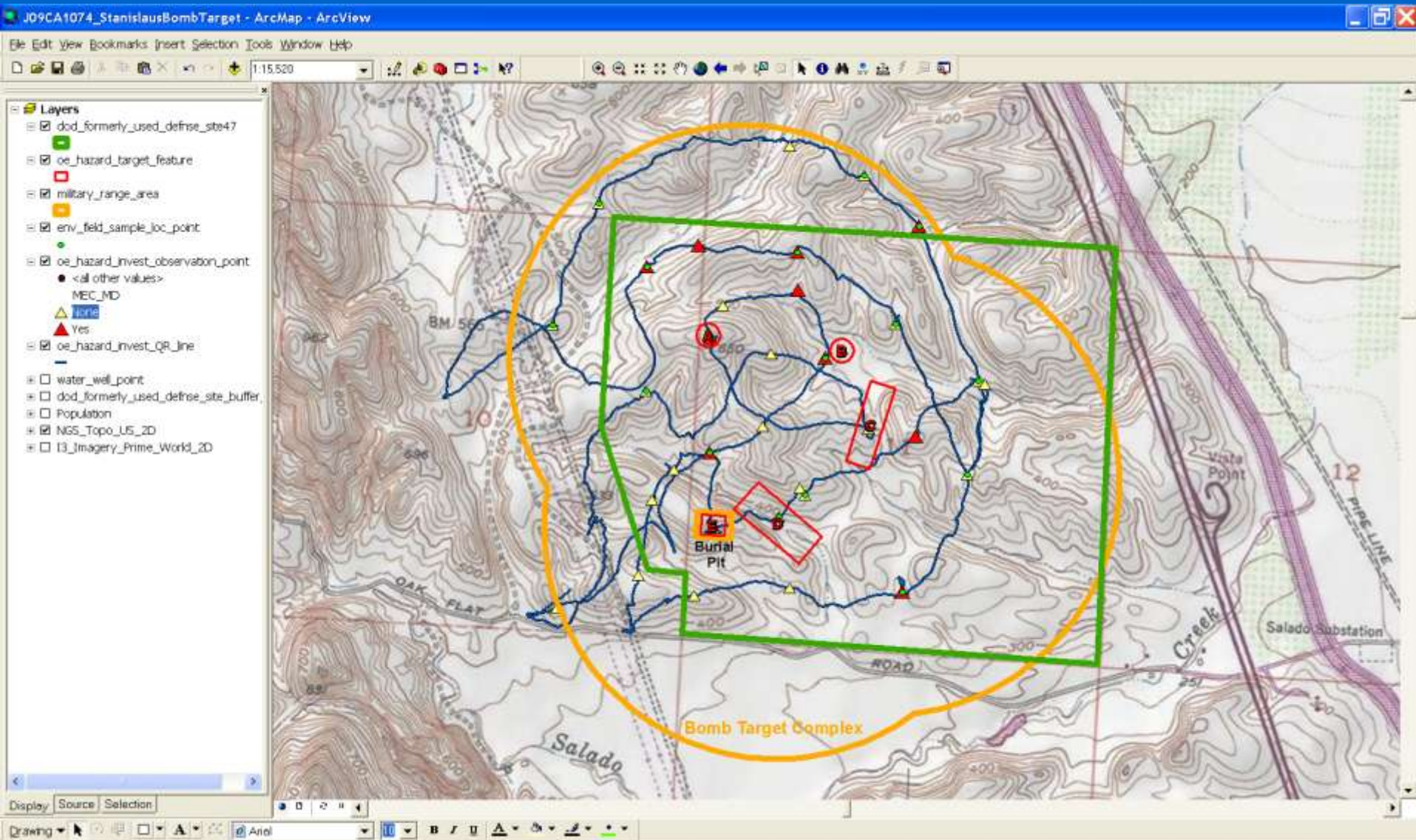
Kirtland Simulated Oil Refinery Target

Types of FUDS MMRP Geospatial Data

- Initial Identification – Inventory Project Report (INPR)
 - Archive Search Report (ASR)
 - Property Boundaries
 - Range Features (e.g., firing lines, bombing targets)
 - Some Field Data Locations and Photos
- Site Inspection (SI) - Sample Designs and Field Data
 - Qualitative Reconnaissance (QR Tracks)
 - Field Samples (soil, water)
 - Other Existing GIS Data – water wells, population, sensitive habitats, etc.
- Geospatial Data Sources
 - Text Descriptions (e.g., legal property descriptions)
 - Historical Maps (plans and as-built drawings)
 - Aerial Photos
 - GPS and other Survey Equipment

Example of California SI GIS Dataset

(Metadata Review for 54 MMRPs)



FUDS MMRP GIS Data Life Cycle

- Site Activities Follow CERCLA Process
 - Identification, Investigation, Cleanup, Closure/Monitoring
- Long Timeframes
 - Sites are by definition *historical*
 - Oldest MMRP site dates back to the American Revolution
 - FUDS Program schedule currently spans 150 years
- Many Organizations
 - New Site Owners/Stewards and Many Stakeholders
 - Number likely to increase in later stages
- Importance of Data Quality Documentation (Metadata)
 - Effective standards critical to data use and reuse
 - Standards compliance

Geospatial Data Standards and Guidance

- USACE Manual EM 1110-1-2909: Engineering and Design, Geospatial Data and Systems
 - SDSFIE Version 2.6
 - *Version 3.0 (11/2010)*
 - FGDC Content Standard for Digital Geospatial Metadata (Version 2)
 - *North American Profile under Development for ISO 19915: Geographic Information Metadata*
- MMRP-09-007 (Data Item Description)
 - Geospatial Information and Electronic Submittals
- Some Issues
 - Ensuring Compliance
 - Major Changes in Standards and Tools
 - Complexity Hinders Uniform Responses

FUDS MMRP GIS QC Reviews

- New Mexico State FUDS GIS Development (118 MMRPs)
 - ASR and 2005 Orthophotos
- ESTCP Research Project (8 MMRPs)
(Environmental Security Technology Certification Program)
“Improved Processing, Analysis, and Use of Historical Photography”
 - Comparison of 3 Photo Interpretation Methods
- California FUDS-MMRP (54 MMRPs)
 - Site Inspection (SI) GIS Data

CERCLA Implementation Steps

■ Identification

- Preliminary Assessment ◀
 - Inventory Project Report (INPR) and Archive Search Report (ASR)
- Site Inspection ◀

■ Investigation

- Remedial Investigation/Feasibility Study
- Proposed Plan
- Record of Decision (ROD)/Decision Document
- Remedial Design

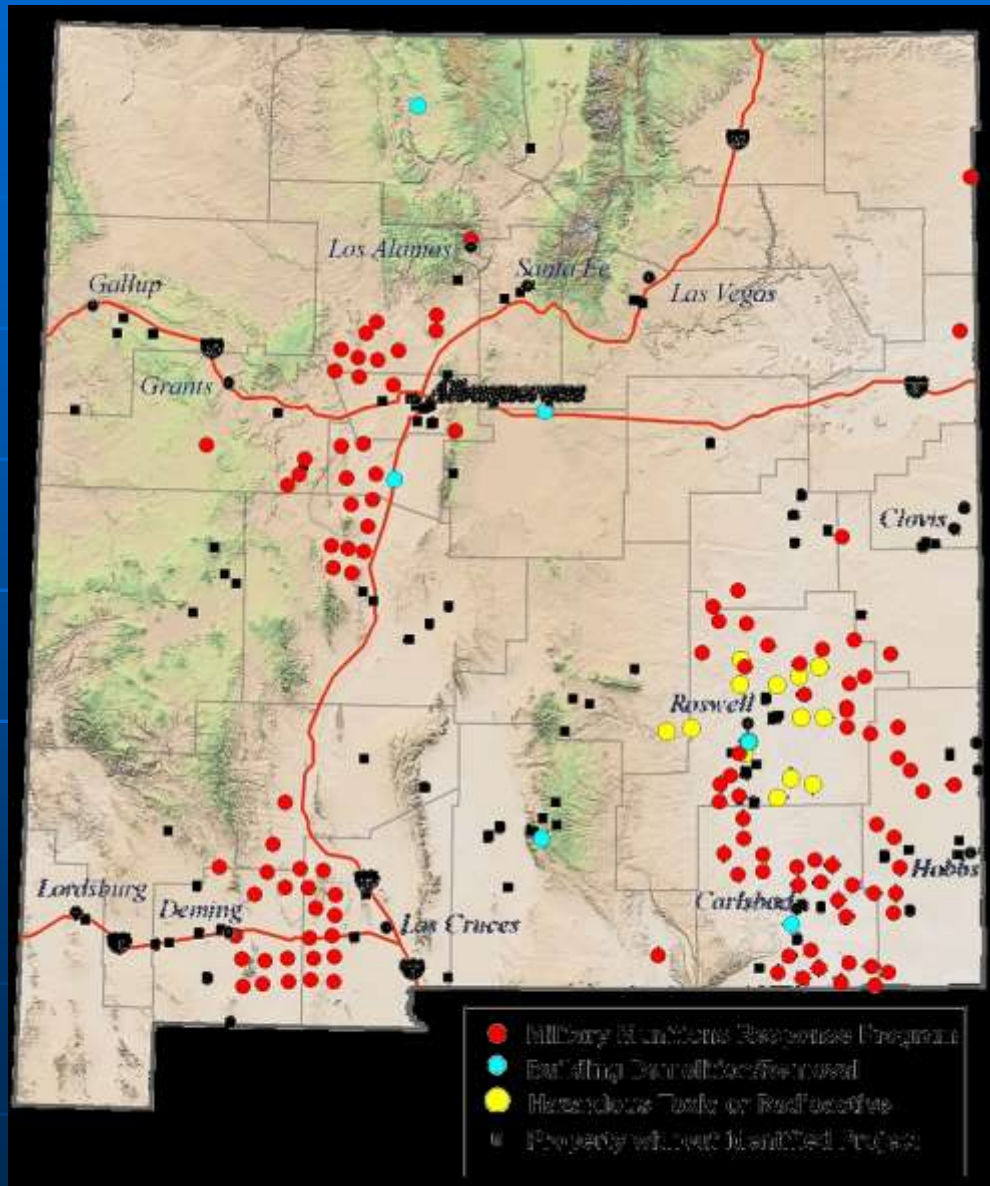
■ Cleanup

- Remedial Action
- Response Complete or Long Term Management

■ Five Year Reviews

New Mexico FUDS GIS

(118 MMRPs)



- Compilation of ASR CAD Files
- Conversion to GIS Format (snapped to PLSS)
- Visual Cross-Check Against 2005 Color Orthophotos
- ASR method (1990's) involved transfer from uncorrected photos to topographic maps (2005 orthos were not available)

2005 Orthophoto



Former Walker Air Force Base (AFB) Precision Bombing Range (PBR) #21

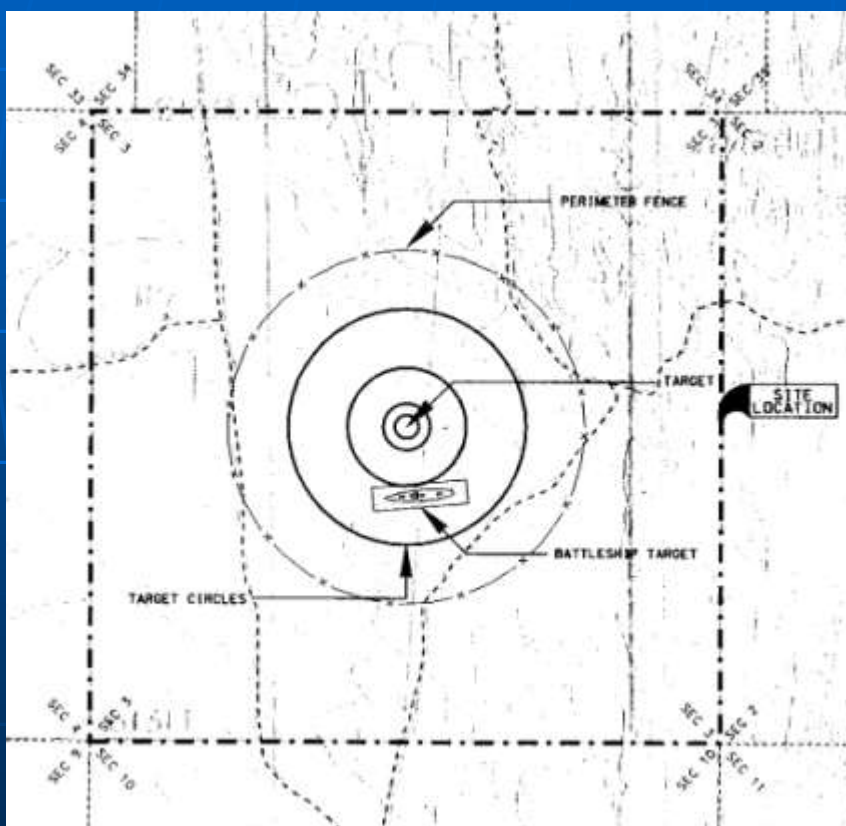
1945 Photo and 2005 Orthophoto



Former Kirtland Air Force Base (AFB) Precision Bombing Range (PBR) West Mesa Site – Engine Roundhouse and Switching Yard Targets

Archive Search Reports (ASR)

NOTE: AREAS DEPICTED ARE BASED ON BEST AVAILABLE DATA



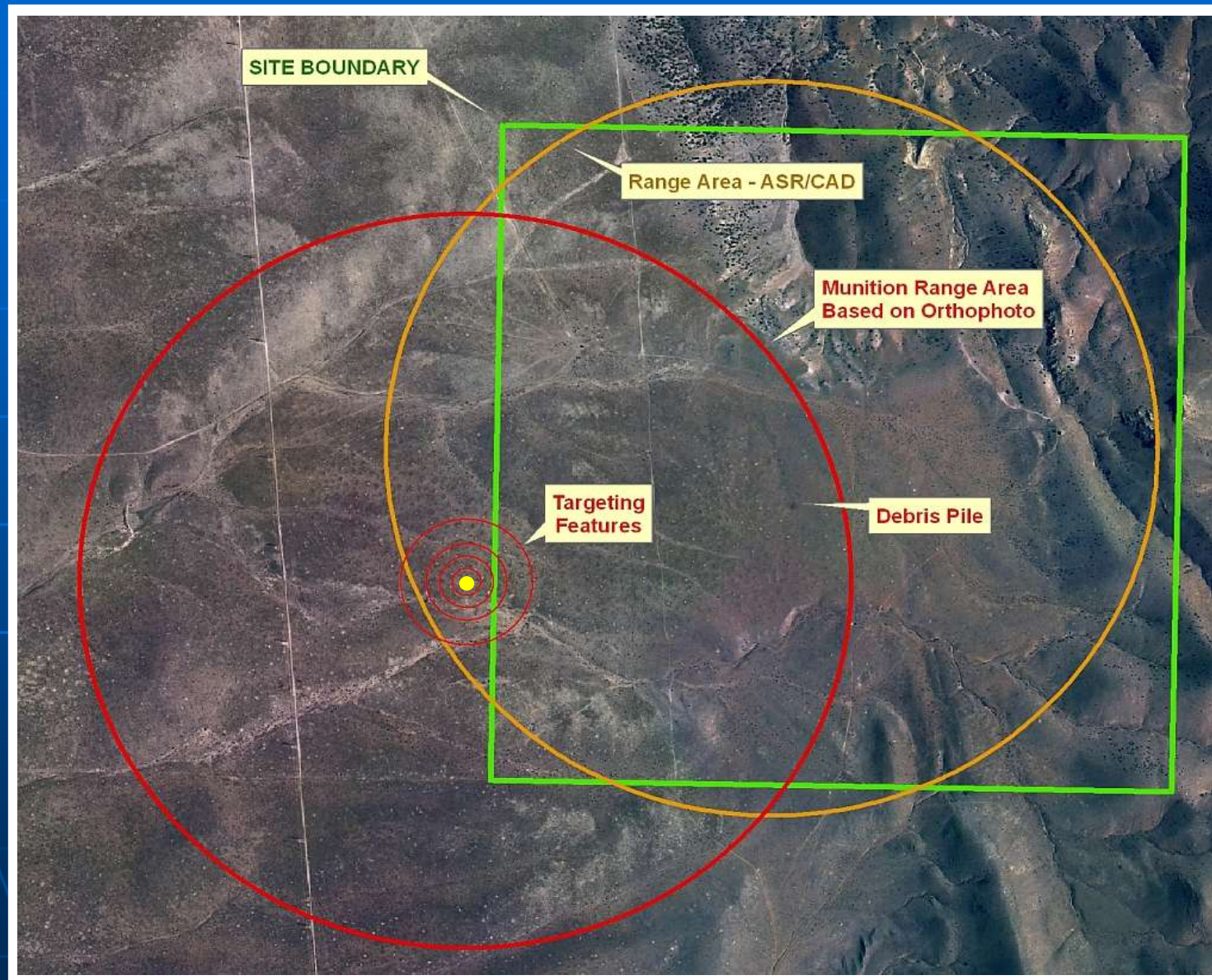
ASR Map and NOTE for KAFB PBR 22 TRGT S-9

Primary Source for FUDS Property and Range Feature Data



Assumed “Target Center” based on 1952 photo prints and pocket stereoscope viewing

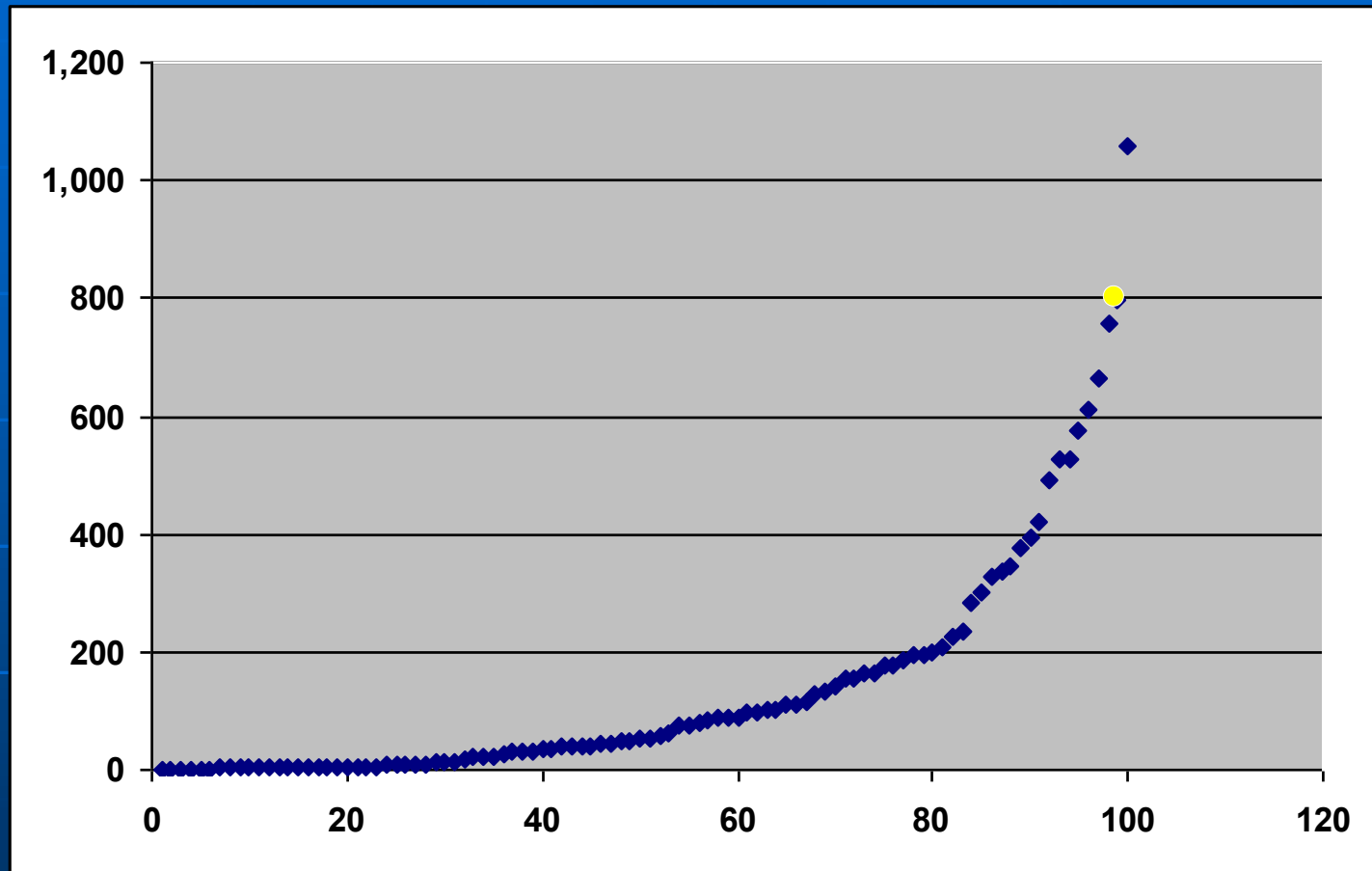
2005 Orthophoto



K06NM0623: KAFB PBR 22 TRGT S-9 [1 Section = 1 sq mile = 640 acres]

Range Centroid Orthophoto Adjustments

**Offset
Distance**
(meters)
ASR/CAD
to 2005
Orthophotos



Sort of Site Centroid Location Offsets

Over 65% of NM FUDS MMRP Range centroids checked had apparent offsets >25 meters

ASR Observations

- Data Sources and Procedures Well Documented
 - But source details not carried forward as metadata
 - Confidence statements not carried forward as metadata
- Historical Photography
 - Dates used were sometimes decades after site operational periods – some features not very persistent and some affected by land use changes
 - Use of Photo Prints and Pocket Stereoscope viewers instead of Film Diapositives (transparencies) and Zoom Stereoscope equipment affects dynamic range and resolution available – some range features missed

ESTCP Project

ESTCP Research Project

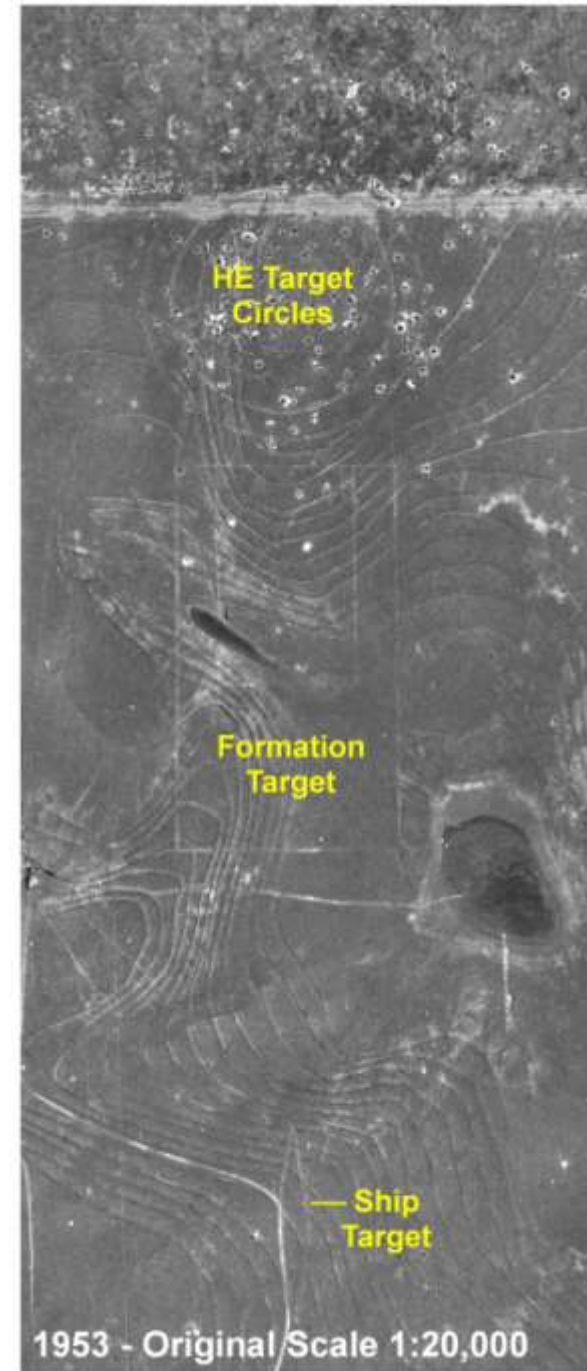
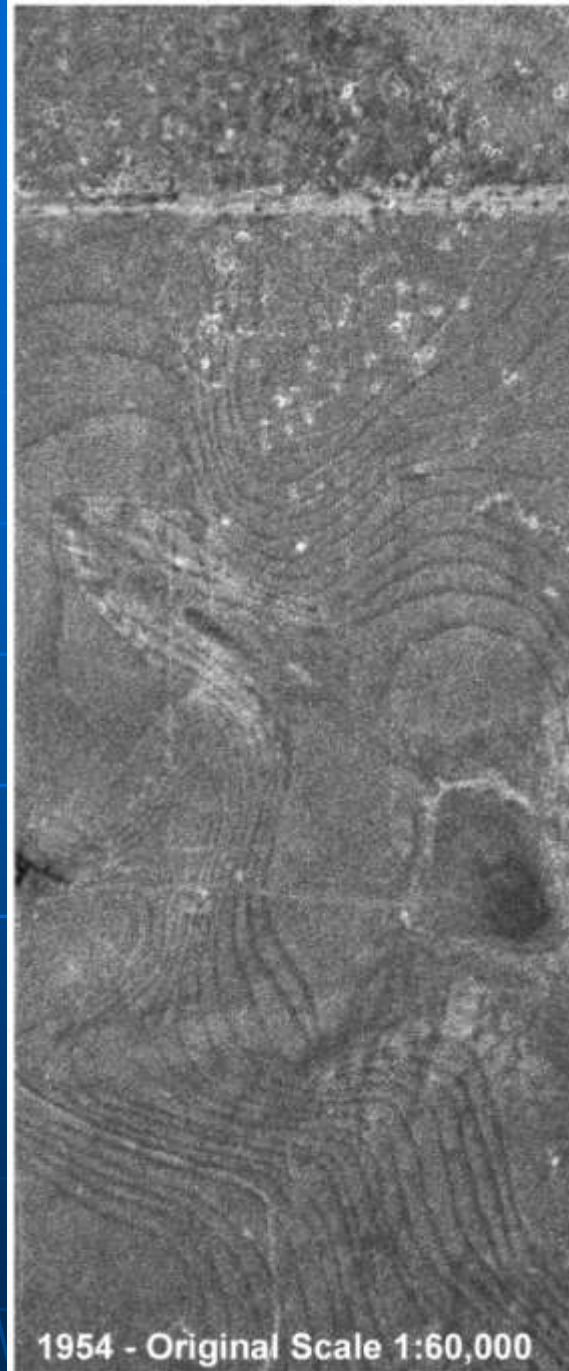
(8 MMRPs)

- Environmental Security Technology Certification Program
"Improved Processing, Analysis, and Use of Historical Photography" (2010)
- Comparison of 3 Photo Interpretation Methods
 1. ASR Photo Interpretations – Prints and Simple Viewers
 2. ESTCP – Film Diapositives/Zoom Stereoscopes
 3. ESTCP – Digital Restoration/Enhancements 3D Viewers

Dates of Photography

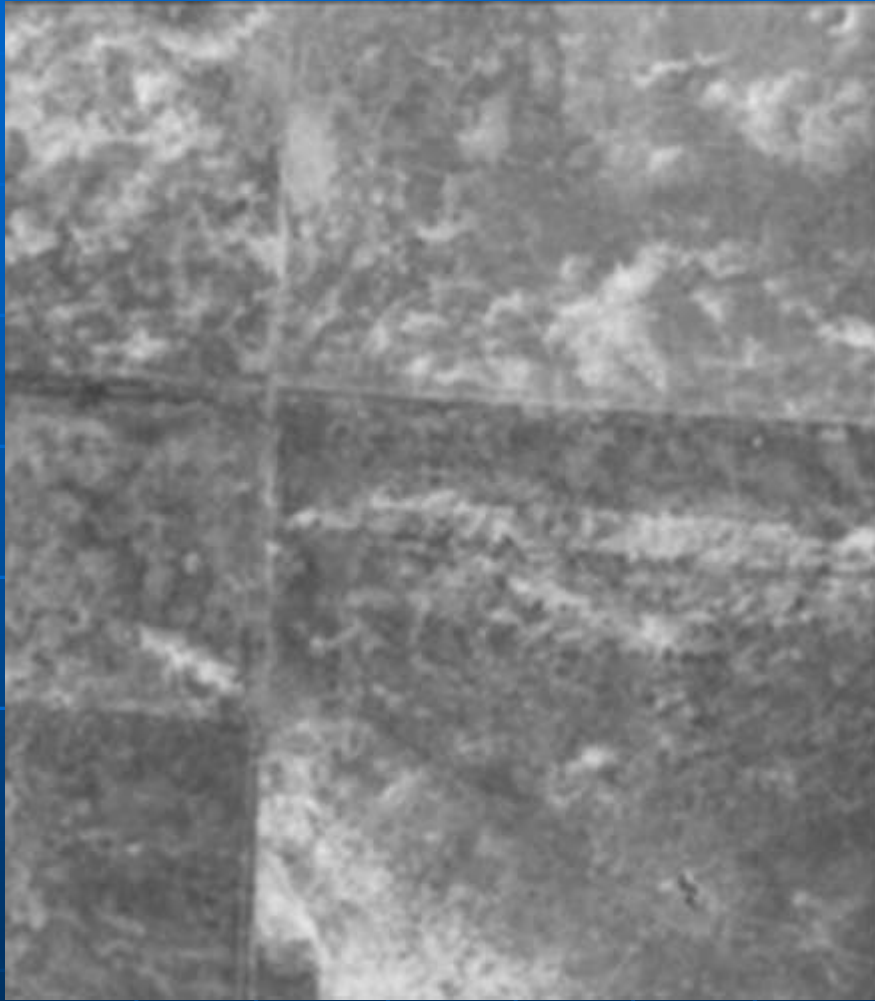


Photo Scale (Resolution)



0 250 500 1,000 Feet

Scanning Resolution



1000 DPI



3629 DPI

1954 Photo for Dalhart PBR #3 & #4 (1:60,000 scale)

ESTCP Observations

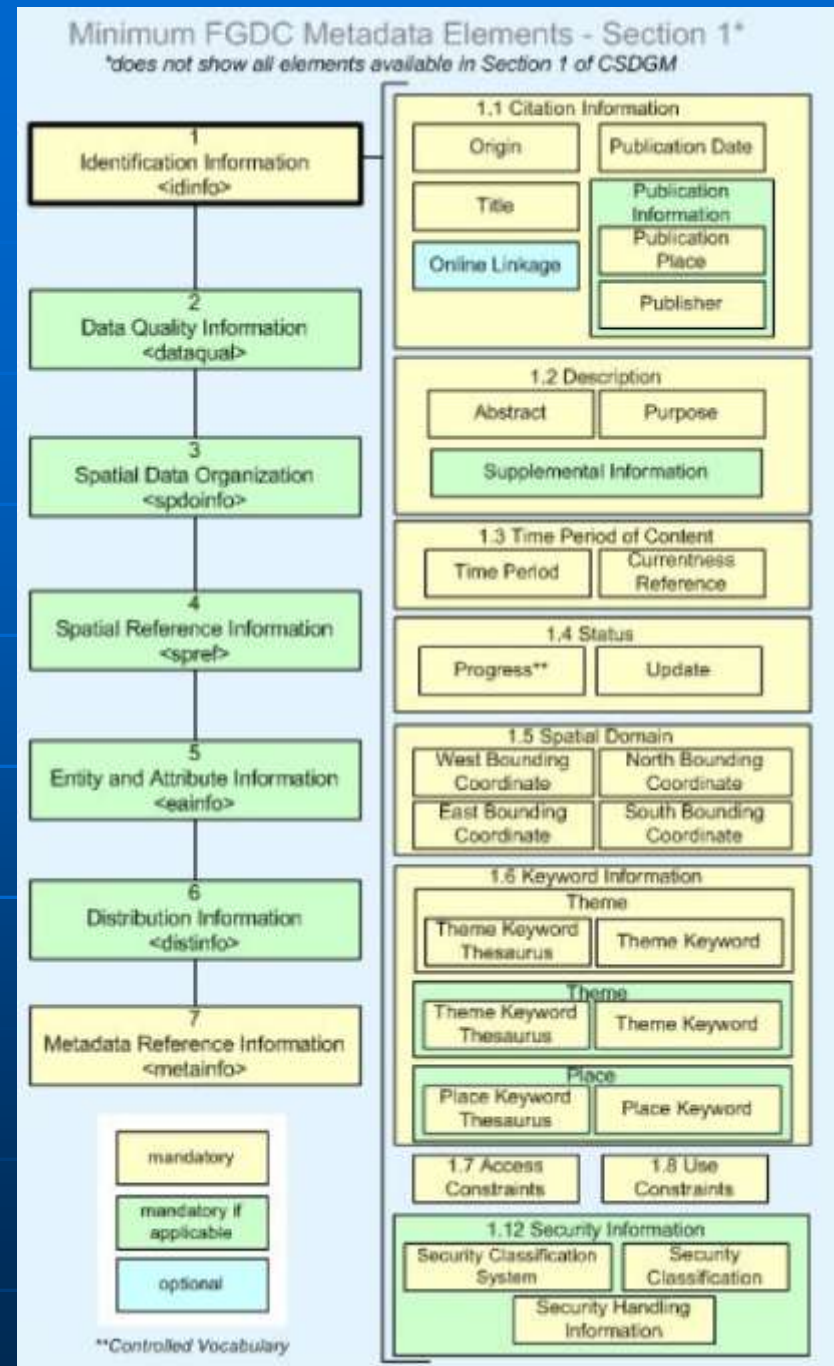
- Some historical photo searches need to be updated and more extensive – photo search results are not static as archive additions are made and search tools are improving
- Use of historical film diapositives and digital analysis techniques can result in improved target feature interpretations and proper range definitions
- Image registration or ortho-correction provides a useful basis for analysis and use of historical photos in Geographic Information Systems
- Historical photo analyses can provide a cost-effective baseline component prior to any Wide Area Assessment (WAA) of World War II era Bombing Ranges

California MMRP SI Metadata Review

- Frequent Findings (54 MMRPs)
 - Identification of site (FUDSMIS ID) inconsistent
 - 8-digit, 9-digit, 10-digit FUDSMIS
 - Source material references limited
 - Generally just “ASR” or “SI” as source (no titles, dates)
 - No original sourcing – aerial photos, maps, etc.
 - Range areas defined by multiple methods
 - Target features, target features plus property
 - Multiple identical ranges defined for same area
 - One range polygon for each type of munitions
 - Feature naming conventions varied
 - Generally well described, but not SDSFIE compliant
 - SDSFIE attributes generally unpopulated

FGDC Metadata

- Relatively Complex
 - Basic framework for all possible types of geospatial data
- Many “free text” elements
 - Open to individual interpretation without restrictions
- Time Consuming
 - Detailed (e.g., 334 elements, many nested)
 - Often “last step” of GIS project



Metadata Tools

■ Examples of Metadata Tools

- USACE Corpsmet (template) – discontinued
- US Geological Survey – Metadata Parser (MP)
- National Park Service – Metadata Tools & Editor (MTE)
- EPA – EPA Metadata Editor (EME)

■ USACE FUDSGeoRev (Proposed)

- Goal – “Facilitate development and review of Metadata that meets FUDS MMRP programmatic and FGDC content standards via tools to ensure consistent, simplified, and high quality metadata”

FUDSGeoRev Design Elements

- Standard Metadata Guidelines and Instructions
 - Identify priority programmatic FGDC metadata elements
 - Develop consistent language and libraries for priority programmatic and mandatory metadata elements
- Metadata Checker utility
 - Online secure server (SSL, 24/7)
 - Downloadable reporting tool
 - Automated review of metadata elements, such as:
 - Theme, place and temporal keywords
 - Use constraints and data quality statements
 - Reference coordinate system
 - Entity and attribute information
 - Upload of compliance results
- Archival Metadata storage
 - Validate metadata against stored templates

Summary

- ASR and SI sources of geospatial data for MMRPs are well documented, but key details and confidence statements are generally not carried forward in GIS metadata
- Historical aerial photos are a unique source for FUDS MMRP features locations, but some searches need to be updated; photo search results are not static!
- Metadata tools, such as guidelines, editors, and checkers, can facilitate development and compliance with needed documentation of geospatial data
- Geospatial standards compliance is critical to data sharing, confidence for future (long-term) reuse, and broader enterprise applications

QUESTIONS?



Dates of Photography



1943



1954



1967



2007

Kingman, AZ GTG
Gunnery Range

15-Skeet Ranges

Clay Pigeon Debris
Apparent on Photos

Used for Field
Sample Design

Example of SI GIS Dataset – Orthophoto Base

